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Comments on the
Waiver Request by Progeny LMS, LLC
in FCC WT Docket 11-49

These comments are prepared for and provided to Warren Havens for Skybridge Spectrum Foundation and Telesaurus Holdings GB LLC to submit to the FCC in the above captioned matter

I am a wireless engineer with 10 years experience designing wireless systems for the 902-928MHz unlicensed band. My resume (not fully updated) is attached below.

I am responding to the waiver request by Progeny LMS, LLC dated March 8, 2011. Mr. Havens and I have common contacts at the University of California, Berkeley in wireless technology and systems field. We have conducted joint investigation of wireless technology and systems for use in 902-928 MHz for location-based applications, both under Multilateration LMS ("M-LMS") licenses and on an unlicensed Part 15 basis. I have developed certain technology to augment the range and reliability for use of this and other spectrum for various purposes, including location of vehicles and other moving things.

In my opinion, the waiver request is too vague to understand the effect that technology and systems under the proposed waived rules, verses the current rules, would have on unlicensed devices and systems of unlicensed devices operating in the 902-928MHz band, as well as to determine the impact upon wireless Intelligent Transportation Systems ("ITS") using M-LMS spectrum operating under the current rules (with no waivers). The likely effect is adverse. Below I give examples.

Page 14 paragraph 3 states that the public interest would be served by granting Progeny's request because Progeny's approach would greatly reduce the potential for interference to Part 15 devices operating in the M-LMS spectrum. The argument is that since Progeny's technology is broadcast only and not two way, this would reduce interference. This argument is flawed since even a broadcast only technology can cause as much or more interference to Part 15 devices than two-way service.

To understand the effect of the interference, Progeny would have to provide information about the transmitter antenna height, transmitter effective output power, power control, transmitter placement and density, transmit time and duty cycle, signal bandwidth and spectrum mask of their proposed transmit signal, "cognitive" or "dynamic spectrum access" technologies used, if any, etc.

In addition, wide-area wireless networks results and the effects upon co-channel and adjacent-channels users in the area require sophisticated modeling and testing. Major commercial wireless carriers typically perform this in house. There are, however, tools and services that are available on the market such as shown in the following: http://www.opnet.com/solutions/network_rd/modeler_wireless.html. For a meaningful assessment of M-LMS networks under current rules, and types and levels of service provided, verses those that may result if Progeny's requested waivers are granted, networks simulations would have to be made, compared and presented, with their many component assumptions on the device level and network level.

In addition to a detailed transmitter deployment plan, Progeny should provide a detailed spectrum mask of their proposed signal so that other M-LMS operators can better understand the adjacent channel interference effects.

I understand the issue here is that Progeny claims its vaguely described technology and systems will improve upon what is possible under current rules: technical and/ or public-interest improvements, but that is only possible by presenting details and simulation (or real life test) results of what is proposed vs. what is required and permitted under the current rules.

Broadcast generally assumes transmitters at high height and the higher end of permitted ERP. Since part 15 devices are low power devices, a high power broadcast only technology can still cause significant co-channel as well as adjacent channel interference to part 15 unlicensed devices operating within the same band. This may also adversely affect adjacent-channel M-LMS systems operating under the current rules, for example, if the broadcast-only system uses higher transmit heights vs. the two-way M-LMS systems on adjacent spectrum optimized for traffic capacity and reliability.

Page 11 paragraph 4 states that the public interest would be served since Progeny's positioning technologies are significantly more accurate and reliable than

existing services, particularly in challenging environments such as indoors and urban canyons. Progeny however has not provided information to be able to make such a bold claim. Indoor environments pose significant challenges including multipath and severe signal attenuation. Furthermore, interference from other unlicensed users in the 902-928 MHz band, which concentrates in and near buildings, can significantly degrade the positioning accuracy and even make positioning impossible. Although today's GPS technology does not work indoors beyond limited degrees, it does use licensed spectrum which makes it very reliable in outdoor environments (but with varying accuracy due to multipath, satellite blockage, and other causes if not augmented and corrected). Furthermore, coupling GPS technology together with low cost inertial measurement units can allow GPS technology to provide accurate positioning even in indoor environments.

In addition, Progeny does not explain why its proposed M-LMS location service for use in and near buildings would have advantages over proven Ultra-wideband local-area location technology and systems. The reasons why Ultra-wideband achieves high accuracy location in difficult multipath environments is well known, and commercialization has begun.[1]

Progeny should provide detailed simulation results to back up their claims, such as to demonstrate that they can provide reliable and accurate positioning in indoor environments with significant multipath. As their request stands, it lacks the fundamental technical information needed to assess if its vaguely described proposed technology and systems may improve upon what can be provided under the current rules, for ITS or other permitted applications.

Progeny's proposal for a one way broadcast technology for M-LMS would limit the benefit of the M-LMS band for ITS networks. An ITS network must be able to probe vehicles for their status and locations periodically, receive responses, deliver location-based and other critical instructions and data, and conduct other two-way communications. This can only be done reliably using a dedicated 2 way channels between vehicle and base stations such as provided for under the current M-LMS rules

[1] Here are several examples:
http://www.ubisense.net/en/products/precise-real-time-location.html
http://www.zebra.com/id/zebra/na/en/index/products/location/ultra_wideband.html

(as opposed, e.g., to using commercial wireless for the return paths). For example, vehicles that are involved in an accident should be able to immediately and automatically report their locations and the severity of the accident to first responders. Section 90.155(e) states that an M-LMS network must be able to interrogate a mobile for these critically important ITS and safety purposes.

Pursuant to Section 90.353(g), M-LMS operators are permitted to provide location service to non-vehicular devices only on an ancillary basis. Progeny requests a waiver on this rule so that they have no obligation to serve vehicles. However, considering only technical ramifications, this could significantly increase the interference to other users of the 902-928MHz band. This is due to the fact that to provide services to non-vehicular devices would require a much higher density of transmitters in the areas those other devices are most used: away from roadways and generally in and around buildings. This is especially true in indoor environments where there is significant signal attenuation. In addition, by moving from roadway vehicle services to other services, the peak hour of use will shift and this is likely to coincide more with unlicensed use, since it is not for roadway vehicle service.

While Progeny's waiver proposal is vague, the principals would increase competition in spectrum use in space and time with unlicensed use, as compared to vehicle ITS services under the current rules. Again, without technical details and network simulation showings noted above, what Progeny has in mind and the results of it cannot be understood, including the interference effect on co-channel unlicensed users and adjacent-channel unlicensed and other M-LMS licensed users.

An additional problem with granting a waiver of Section 90.353(g) is that it could have an adverse impact on other M-LMS network operators. A dense network of high height broadcast transmitters of sufficient power and density to provide indoor services as Progeny proposes could cause adjacent channel interference to sensitive M-LMS receivers operating in nearby channels, especially if they use spectrum efficient higher orders of modulation and a higher density of fixed transceivers to provide two-way wireless services to vehicular traffic at busy hour.

Ben Wild

April 10, 2011 drafted

April 12, 2011 finalized and executed

Ben Wild

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Education

Phd Candidate in Electrical Engineering — University of California, Berkeley
Research area: Wireless/ Cognitive Radio design — Sept. 04 – Jan. 07

- Emphasis in Wireless Communications

Masters Degree in Electrical Engineering, — University of California, Berkeley
Thesis: Digital Decompression ASIC for Maskless Lithography — Sept. 00 – Jan. 02

- Emphasis in Digital Circuit Design

Bachelor of Science in Electrical Engineering — University of Illinois, Urbana Champaign
Graduated with high honors, technical GPA 3.9/4.0 — Sept. 96 – May 00

- Emphasis in circuit design, analog and digital communications

Work Experience

Sole Proprietor — Etrack
Wireless sensing and Tracking Technologies — Aug 09 - present

- Developed new wireless technology that could provide low data rate communications over several mile range. Target market is sensing and tracking devices.
- Worked with potential customers and partners to gather product requirements.
- Implemented technology using FPGA, embedded processors. Developed web interface to google maps.
- Wrote patent describing core technology.

President — Wirama, Inc
RFID Reader and Positioning System — Jan. 07 – July 09

- Company was acquired on 11/2008.
- Managed team of 2 full time engineers, and 2 part time consultants in the development of RFID reader capable of locating passive standard compliant RFID tags in 3D space
- Built relationships with potential partners and customers.
- Implemented and analyzed sophisticated RF algorithms for computation of angle of arrival, TX/RX beam forming, and low SNR decoding
- Wrote several patents describing core technology.

Graduate Student Researcher — Berkeley Wireless Research Center
Cognitive Radio — Sept. 04 – Jan 07

- Developed algorithms for more efficient usage of wireless spectrum.
- Designed and built testbed for distributed wireless beamforming.
- Designed and built RF circuits for detection of weak local oscillator leakage from receivers.
- Published and presented in conferences and workshops

Systems Engineer — Northrop Grumman
Research and Development Group — Sept. 02 – Sept. 04

- Developed Algorithms for image and signal processing. Implemented algorithms in DSP and FPGA.
- Designed analog and digital circuits

Relevant Skills

Software: MATLAB, Simulink, Labview, Ansoft HFSS,XILINX ISE and EDK, ModelSim, Microchip PIC development tools
Lab skills: Spectrum analyzers, oscilloscopes, logic analyzers, network analyzers, signal generators
Languages: C, C++, VHDL

Publications

- O Bakr, M Johnson, **B Wild**, K Ramchandran, ***A multi-antenna framework for spectrum reuse based on primary-secondary cooperation***, New Frontiers in Dynamic Spectrum Access Networks, Oct. 2008.
- **B. Wild**, K. Ramchandran, ***Detecting Primary Receivers for Cognitive Radio Applications.***. New Frontiers in Dynamic Spectrum Access Networks, Nov 2005.
- R Mudumbai, **B Wild**, U Madhow, K. Ramchandran, ***Distributed beamforming using 1 bit feedback: from concept to realization***, Allerton Conference on Communication, Control and Computing, Sept. 2006.
- B Nikolić, **B Wild**, V Dai, Y Shroff, B Warlick, Layout Decompression Chip for Maskless Lithography, Emerging Lithographic Technologies VIII, Proceedings, 2004.

Patents Pending

- **Wild, B.** ***Long Range Wireless RFID System***, US Patent No. 12/830,923 July 2010.
- **Madhow U., Ramchandran, K, Wild B, Tkachenko A**, ***Localizing Tagged Assets Using Modulated Backscatter***, US Patent No. 2009212921 Sept. 2009.
- **Wild B, Madhow U, Ramchandran K**, ***RFID Repeater For Range Extension in Modulated Backscatter Systems***, US Patent No. 20090548993 June. 2010.
- **Wild B, Madhow U, Ramchandran K**, **Tkachenko A**. ***Range Extension and Multiple Acces in Modulate Backscatter Systems.***, US Patenti No. 20090406629 March 2010.
- **Madhow U, Wild B, Ramchandran K**. ***Systems and Methods of Beamforming in Modulate Backscatter Systems.***, US Patent No. 20070702980 Jan. 2010.
- **Wild B, Madhow U, Ramchandran K**, **Barton R**. **Tkachenko A**. ***Applique Nodes for Performance and Functionality Enhancement in Radio Frequency Identification Systems.***, US Patent No. 20090407383 Jan 2010.